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HP 83572A/B RF PLUG-IN (Including Options 001 and 006)

SERIAL NUMBERS

This manual applies directly to any HP Model 83572A RF Plug-In having a serial number with the prefix 2343A, or to any HP Model 83572B having a serial number with the prefix 2346A.

With changes described in Section VII, this manual also applies to any Model 83572A with a serial number prefixed 2304A or lower.

For additional information about serial numbers, refer to INSTRUMENTS COVERED BY MANUAL in Section I.

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**HEWLETT
PACKARD**

SAFETY CONSIDERATIONS

GENERAL

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation. This product has been designed and tested in accordance with international standards.

SAFETY SYMBOLS



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents).



Indicates hazardous voltages.



Indicates earth (ground) terminal.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

SAFETY EARTH GROUND

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

BEFORE APPLYING POWER

Verify that the product is configured to match the available main power source per the input power configuration instructions provided in this manual.

If this product is to be energized via an autotransformer, make sure the common terminal is connected to the neutral (grounded) side of mains supply.

SERVICING

WARNING

Any servicing, adjustment, maintenance, or repair of this product must be performed only by qualified personnel.

Adjustments described in this manual may be performed with power supplied to the product while protective covers are removed. Energy available at many points may, if contacted, result in personal injury.

Capacitors inside this product may still be charged even when disconnected from its power source.

To avoid a fire hazard, only fuses with the required current rating and of the specified type (normal blow, time delay, etc.) are to be used for replacement.

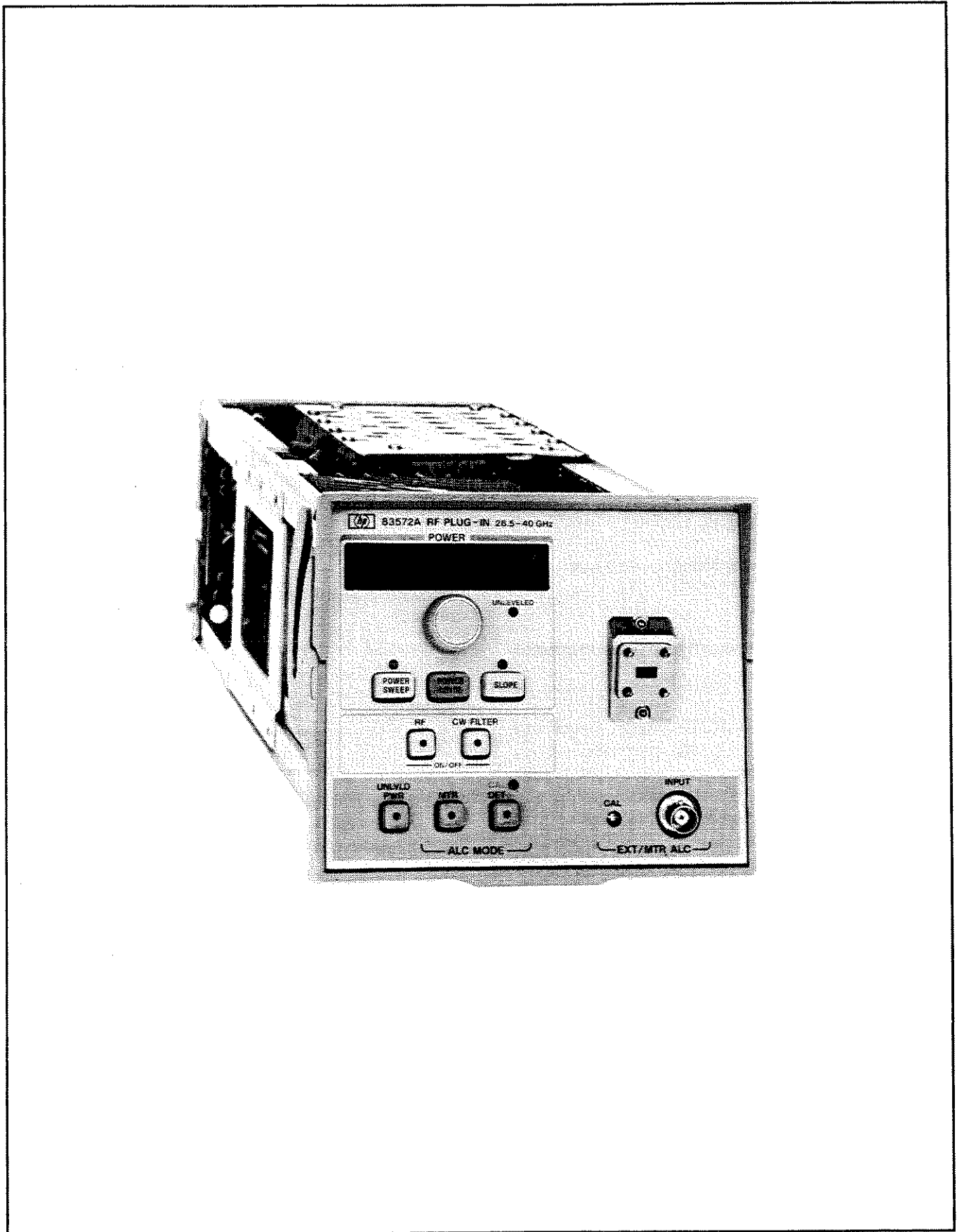


Figure 1-1. Model 83572A RF Plug-In

SECTION I GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This Operating and Service Manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard model 83572A/B RF Plug-In. The information provided here applies to both the 83572A and the 83572B unless specified otherwise. Figure 1-1 shows the model 83572A.

1-3. This manual is divided into eight major sections which provide the following information:

- a. SECTION I, GENERAL INFORMATION, includes a brief description of the instrument, safety considerations, specifications, supplemental characteristics, instrument identification, options available, accessories available, and a list of recommended test equipment.
- b. SECTION II, INSTALLATION, provides information for initial inspection, preparation for use, storage, and shipment.
- c. SECTION III, OPERATION, explains the frequency resolution characteristics of the RF Plug-In in CW and swept frequency modes. Operating instructions include FM switch parameter settings, and crystal and power meter leveling instructions. A description of front and rear panel features and Plug-In error codes is also given.
- d. SECTION IV, PERFORMANCE TESTS, presents procedures required to verify that performance of the RF Plug-In is in accordance with published specifications.
- e. SECTION V, ADJUSTMENTS, presents procedures required to properly adjust and align the model 83572A/B RF Plug-In after repair.
- f. SECTION VI, REPLACEABLE PARTS, provides information required to order all parts and assemblies.

g. SECTION VII, MANUAL BACKDATING CHANGES, provides backdating information required to make this manual compatible with earlier shipment configurations of the model 83572A.

h. SECTION VIII, SERVICE, provides an overall instrument block diagram with troubleshooting and repair procedures. Each assembly within the instrument is covered on a separate Service Sheet which contains a circuit description, schematic diagram, component location diagram, and troubleshooting information to aid in the proper maintenance of the instrument.

1-4. Supplied with this manual is an Operating Information Supplement. This is simply a copy of the first three sections of the manual, which should be kept with the instrument for use by the instrument operator.

1-5. On the title page of this manual is a Microfiche part number. This number may be used to order 10- by 15-centimeter (4- by 6-inch) microfilm transparencies of the manual. Each microfiche contains up to 60 photo duplicates of the manual pages. The microfiche package also includes the latest Manual Changes sheet as well as all pertinent Service Notes.

1-6. Refer any questions regarding this manual, the Manual Changes sheet, or the instrument to the nearest HP Sales/Service Office. Always identify the instrument by model number, complete name, and complete serial number in all correspondence. Refer to the inside rear cover of this manual for a worldwide listing of HP Sales/Service Offices.

1-7. SPECIFICATIONS

1-8. Listed in Table 1-1 are the specifications for the model 83572A and 83572B RF Plug-Ins. Where the specifications for the model 83572A and 83572B are different, they are listed separately. Where the specifications for both instruments are the same, only one listing is supplied.

These specifications are the performance standards, or limits, against which the instrument may be tested. Table 1-2 lists the 83572A/B supplemental performance characteristics. Supplemental performance characteristics are not specifications but are typical characteristics included as additional information for the user.

1-9. SAFETY CONSIDERATIONS

1-10. This product has been manufactured and tested in accordance with international safety standards. Before operation, this product and related documentation must be reviewed for familiarization with safety markings and instructions. A complete listing of Safety Considerations precedes Section I of this manual.

1-11. INSTRUMENTS COVERED BY MANUAL

1-12. Attached to the rear panel of the instrument is a serial number plate. A typical serial number plate is shown in Figure 1-2. The serial number is in two parts. The first four digits followed by a letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each instrument. The content of this manual applies directly to instruments having a serial number prefix that is listed on the title page of this manual under SERIAL NUMBER.

1-13. An instrument manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. An unlisted serial prefix indicates that the instrument is different from those documented in this manual. In this case, the manual for the instrument is supplied with a Manual Changes supplement that contains information which documents the differences.

1-14. In addition to change information, the Manual Changes supplement may contain information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to the manual's print date and part number, both of which appear on the title page. Complimentary copies of the Manual Changes supplement are available on request from Hewlett-Packard.

1-15. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes Supplement, contact your nearest Hewlett-Packard Sales/Service Office.

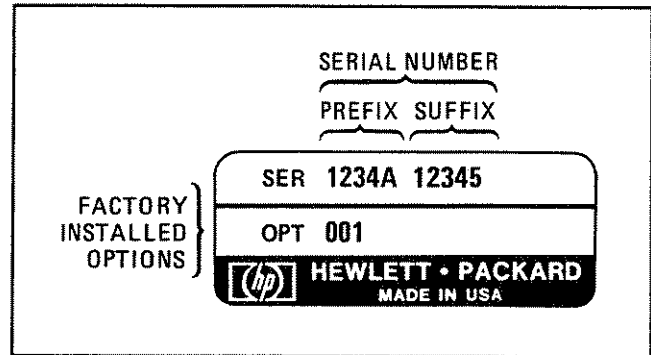


Figure 1-2. Typical Serial Number Plate

1-16. DESCRIPTION

1-17. The model 83572A/B is an RF Plug-In which has been designed for use with the model 8350A/B Sweep Oscillator. The model 83572A/B covers the frequency range of 26.5 to 40.0 GHz in a single band. A YIG Oscillator is used as the tunable RF frequency source.

1-18. The model 83572A/B front panel functional controls, pushbuttons, and the rotary pulse generator (RPG) are monitored by the model 8350A/B through the RF Plug-In interface circuits. The model 8350 generates a tuning voltage according to the mode of operation (CW, START/STOP, CF/ Δ F). This signal is scaled and offset by the Plug-In to provide a voltage ramp (in swept modes) proportional to the YIG Oscillator frequency. The model 83572A/B tuning circuits accept the tuning ramp output from the model 8350 and convert it to a current which drives the YIG Oscillator.

1-19. The standard model 83572A offers an unlevelled RF output power of at least +3 dBm (typically +4 to +5 dBm). The standard Model 83572B offers an unlevelled RF output power of at least +7 dBm (typically +8 dBm). The RF output power level is controlled by the model 83572A/B RPG, by the model 8350A/B data entry controls (keypad and step keys), or through HP-IB (Hewlett-Packard Interface Bus) control via the model 8350. A front panel LED indicates when the RF output is unlevelled. Front panel push-buttons select either unlevelled power (UNLVLD

PWR), power meter leveling (MTR), or external crystal detector leveling (DET). A front panel EXT/MTR ALC input connector and gain control (CAL) are provided to use with an external leveling loop. Calibrated externally leveled power can be achieved with a standard model 83572A/B, by making internal adjustments to calibrate the instrument to an appropriate external coupler and crystal detector connected to the waveguide output. Refer to Section V, Adjustments, for the calibration procedure. The calibrated externally leveled output power mode is accessed by pressing [SHIFT] [DET]. In the SHIFT DET mode the CAL light above the DET pushbutton is lit, and the displayed power level is calibrated across the entire frequency band.

1-20. The RF output may be turned off with the [RF] ON/OFF pushbutton. An internal switch is set to select whether the RF is on or off at turn-on. RF power ON is indicated by the LED in the center of the pushbutton. Additionally, in CW mode, the [CW FILTER], when selected, places a capacitor across the YIG Oscillator tuning coil to filter high frequency noise which would appear at the RF output. All front panel functions, with the exception of the EXT/MTR ALC CAL adjustment, may be set or altered via the HP-IB bus connection on the model 8350. HP-IB is Hewlett-Packard's hardware, software, documentation, and support for IEEE-488 and IEC-625, worldwide standards for interfacing instruments.

1-21. The RF output may be externally amplitude or frequency modulated. An external mod-

ulation signal is applied to the 8350A/B rear panel AM INPUT or FM INPUT connector. FM coupling (direct coupled or cross-over) and sensitivity are selected by an internal configuration switch in the model 83572A/B. Refer to Section III, Operation, of this manual for detailed information on the configuration switch.

1-22. OPTIONS

1-23. The 83572A Option 001 offers calibrated externally leveled output power of at least +2 dBm in the SHIFT DET mode, the 83572B Option 001 at least +6 dBm. In this mode the CAL light above the DET pushbutton is lit, and the displayed power level is calibrated across the entire frequency band. The Option 001 incorporates a 10-dB directional coupler, a crystal detector, a BNC cable calibrated to the Plug-In, and a package of hex screws for attaching the waveguide flanges. Figure 1-3 illustrates the front panel attachments of the Option 001.

1-24. In the 83572A Option 001 a power sweep function allows the RF output power to be swept at least 7 dB, in the 83572B at least 11 dB, during CW or swept frequency modes. Power sweep is selected with the front panel [POWER SWEEP] pushbutton. Slope compensation control up to 5 dB/GHz (7 dB total calibrated dynamic range in the 83572A, 11 dB in the 83572B) is also available by selecting the [SLOPE] pushbutton and rotating the model 83572A/B RPG or manipulating the model 8350A/B data entry controls. LEDs above the [POWER SWEEP] and [SLOPE]

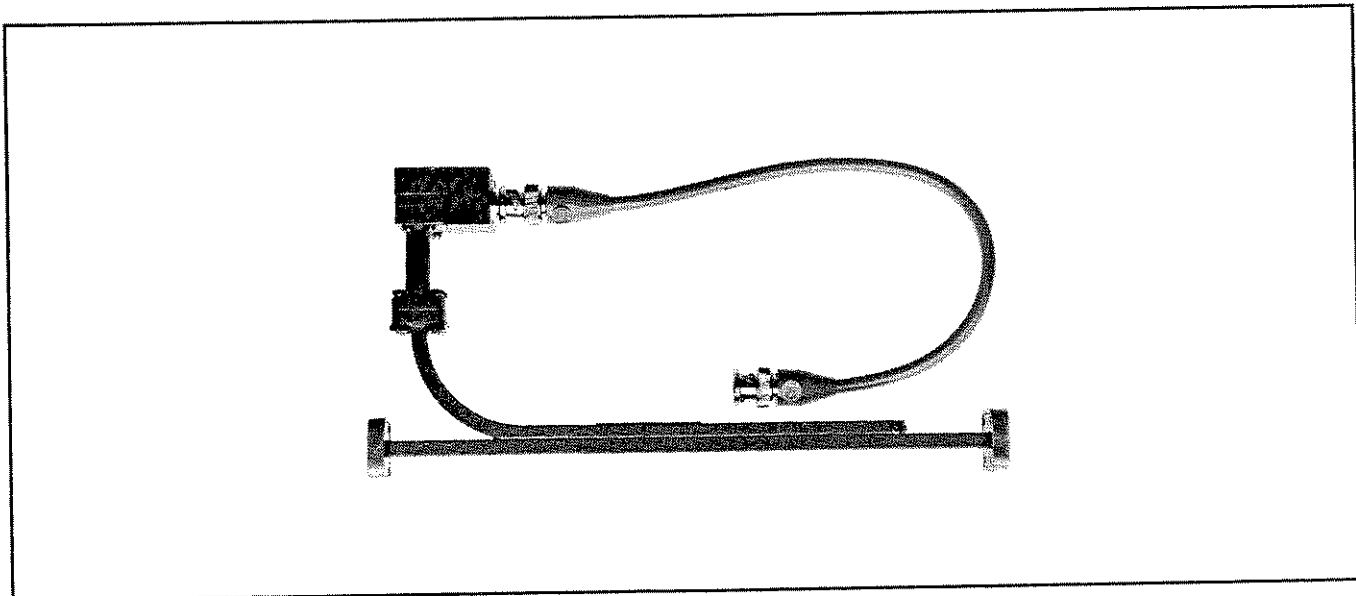


Figure 1-3. Option 001 Front Panel Attachments

pushbuttons indicate when these functions are operative. The power sweep function and slope compensation may both be selected and modified through HP-IB control with the model 8350.

1-25. The 83572A/B Option 006 provides internal squarewave modulation and external pulse and squarewave modulation capabilities, as well as RF amplitude markers. Internal squarewave modulation can be accessed by the 8350 front panel or through HP-IB. The modulation frequency is preset with a jumper in the 8350 either to 1 kHz or to 27.8 kHz for compatibility with Hewlett-Packard scalar network analyzers. For external pulse or squarewave modulation, a rear panel BNC connector accepts a modulating signal up to 1 MHz.

1-26. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-27. To have a complete operating Sweep Oscillator unit, the model 83572A/B RF Plug-In must be installed in a model 8350A/B Sweep Oscillator mainframe. Refer to Section II, Installation, of this manual for a detailed description of RF Plug-In installation.

1-28. EQUIPMENT AVAILABLE

1-29. Service Accessories

1-30. A service accessory kit (HP part number 08350-60020) is available for servicing the model 83572A/B RF Plug-In and the model 8350A/B Sweep Oscillator. HP part numbers for the individual pieces of the kit are provided in Table 1-3. The accessory kit includes:

- Two 44-pin printed circuit board extenders. These boards have keyed slots which allow them to be used in each of the keyed PC board receptacles in the model 83572A/B, and in the model 8350A/B as well.
- An RF Plug-In extender cable set that provides all electrical connections when the RF Plug-In is removed from the Sweep Oscillator. The RF Plug-In interface connector (P2) and the power supply interface connector (P1) are extended by separate cables.
- One hex ball driver for use in model 8350 front panel repairs.

- One 16-pin and one 20-pin I.C. test clip for probing integrated circuits.

1-31. A listing of service accessories available including service cables, wrenches, and extender boards is given in Table 1-3.

1-32. Model 8756A and Model 8755 Network Analyzers

1-33. The model 8350 Sweep Oscillator with the model 83572A/B RF Plug-In installed is compatible with the model 8756A programmable microprocessor-based network analyzer or the model 8755 network analyzer for broadband swept scalar measurements. The model 8350 provides internal 27.8 kHz squarewave amplitude modulation of the RF output (when the 83572A/B is an Option 006), eliminating unnecessary cable connections to the network analyzer or the use of an external modulator. The model 8350 can also produce alternate sweeps through use of the ALT n function which works in conjunction with the channel switching circuits in the model 8755C. This permits channel 1 on the 8755C to respond only to the model 8350 current state and channel 2 to the alternate state. A single cable (HP part number 8120-3174) connects between the model 8350 rear panel ALT SWP INTERFACE connector and the model 8755C front panel ALT SWP INTERFACE connector. Alternate sweep capability is also available between the 8756A and the 8350B through the HP 8756 System Interface.

1-34. Power Meters and Crystal Detectors

1-35. The RF output can be externally leveled using the HP model 432A Power Meter or negative polarity output crystal detectors. Refer to Section III, Operation, of this manual for detailed information on leveling techniques that may be used with the model 8350/RF Plug-In combination.

NOTE

The model 435A and 436A Power Meters should not be used for external leveling of the HP 83572A/B.

1-36. RECOMMENDED TEST EQUIPMENT

1-37. Equipment required for testing and adjusting the instrument is listed in Table 1-4. Other equipment may be substituted if it meets or exceeds the critical specifications indicated in the table.

Table 1-1. Specifications for Model 83572A/B Installed in Model 8350A/B (1 of 2)

NOTE	
The specifications provided here apply to both the 83572A and the 83572B except in the cases where separate listings are given.	
FREQUENCY¹ Range: 26.5 to 40.0 GHz	
Accuracy (25°C ±5°C)	Stability
CW Mode: ² ±100 MHz All Sweep Modes: (Sweep time ≥100 ms) ±150 MHz Frequency Markers: (Sweep time ≥100 ms) ±150 MHz ±0.5% of sweep width	With 10% Line Voltage Change: ±1 MHz With 10 dB Power Level Change: ±200 kHz With 3:1 Load SWR: ±100 kHz Residual FM, Peak: (10 Hz to 10 kHz Bandwidth) (CW Mode with CW Filter) <60 kHz
POWER OUTPUT¹ (25°C ±5°C) ³	
Minimum Unleveled Output Power: 83572A +3 dBm 83572B +7 dBm Option 001 (at output of external leveling coupler) 1.0 dB less than standard Option 006 (at waveguide output of plug-in) 1.5 dB less than standard Option 001/006 (at output of external leveling coupler) 2.5 dB less than standard	
Power Variation: Externally Leveled: Negative Crystal Detector ALC Mode: ^{4,5} ±0.2 dB Power Meter ALC Mode: ⁶ ±0.2 dB	
Residual AM in 100 kHz Bandwidth: (in dB below carrier) ≥50 dB	
Spurious Signals: (in dB below carrier) Inband: ≥50 dB	
Output SWR Unleveled: <2.0 Option 001 (externally leveled) ⁴ : <1.5	
Resolution (displayed): 0.1 dB/GHz	
Remote Programming (Settable): ±0.01 dB	

Table 1-1. Specifications for Model 83572A/B Installed in Model 8350A/B (2 of 2)

MODULATION											
<p>External AM</p> <p>Maximum Input: 15 V</p>											
<p>Internal Square Wave Modulation (Option 006 Only)</p> <p>Selectable (by internal jumper in 8350A/B) to 1 kHz or 27.8 kHz squarewave modulation. 27.8 kHz modulation ensures operation with Hewlett-Packard scalar network analyzers.</p> <p>On/Off Ratio: Symmetry: 50% ±5% (25°C ±5°C) ≥20 dB</p>											
<p>External FM</p> <p>Maximum Deviation for Modulation Frequencies:</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Modulation Frequency</th> <th style="padding: 5px;">Cross-Over Coupled</th> <th style="padding: 5px;">Direct Coupled⁷</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">DC to 100 Hz</td> <td style="padding: 5px;">±150 MHz</td> <td style="padding: 5px;">±6 MHz</td> </tr> <tr> <td style="padding: 5px;">100 Hz to 200 kHz</td> <td style="padding: 5px;">±3.5 MHz</td> <td style="padding: 5px;">±3.5 MHz</td> </tr> </tbody> </table>			Modulation Frequency	Cross-Over Coupled	Direct Coupled ⁷	DC to 100 Hz	±150 MHz	±6 MHz	100 Hz to 200 kHz	±3.5 MHz	±3.5 MHz
Modulation Frequency	Cross-Over Coupled	Direct Coupled ⁷									
DC to 100 Hz	±150 MHz	±6 MHz									
100 Hz to 200 kHz	±3.5 MHz	±3.5 MHz									
GENERAL SPECIFICATIONS											
<p>Minimum Sweep Time (over full range): 10 ms</p> <p>RF Output Waveguide Connector: EIA size WR 28 waveguide. Mates with JAN UG-599 flange.</p>											
<ol style="list-style-type: none"> 1. Unless otherwise noted, all specifications are at the RF OUTPUT waveguide connector and at 0° to 55°C. 2. Approach desired frequency from low end of band. 3. For temperatures greater than 30°C, output power typically degrades 0.1 dB/°C. 4. Sweep time ≥100 msec. 5. Excludes coupler and detector variation. For external leveling crystal detector output should be between -10 mV and -200 mV. 6. Use HP Model 432A/B/C Power Meter. Sweep duration ≥100 seconds. 7. Crossover-coupled and direct-coupled external FM capabilities are selectable by internal switch in the RF Plug-In. 											

Table 1-2. Supplemental Performance Characteristics for Model 83572A/B
Installed in Model 8350A/B (1 of 2)

NOTE	
Values in this table are not specifications, but are intended to provide information useful in applying the instrument by giving typical but non-warranted performance parameters.	
NOTE	
The performance characteristics provided here apply to both the 83572A and the 83572B except in the cases where separate listings are given.	
FREQUENCY CHARACTERISTICS¹	
Accuracy (25°C ±5°C)	Stability
CW Mode: ² ±20 MHz	With Temperature: ±8 MHz/°C
Manual Sweep: ≤±100 MHz	With Time: ±4 MHz (in a 10-minute period after one hour warmup at the same frequency setting)
All Sweep Modes: ≤±100 MHz (sweep time 10 ms to 100 ms)	Residual FM, Peak: <10 kHz (10 Hz to 10 KHz bandwidth) (CW Mode with CW Filter)
Sweep Mode Linearity: ≤±50 MHz	
OUTPUT CHARACTERISTICS¹	
Power Output: Stability with Temperature: ±0.1 dB/°C Range of Power Level Control Unleveled Output: 30 dB Externally Leveled (Option 001): 83572A 7 dB 83572B 11 dB Option 001/006 1.5 dB less Power Level Accuracy (25°C) Option 001 (externally leveled): ±1.5 dB Power Variation Unleveled Output: ±3 dB Spurious Signals (in dB below carrier) Second Harmonic: ≥20 dB	Output SWR: Unleveled: <1.6 Option 001 (externally leveled): <1.3 Power Sweep (Option 001 only)³ Calibrated Range 83572A ≥7 dB 83572B ≥11 dB Option 001/006 1.5 dB less Accuracy (including linearity): ±1.5 dB Slope Compensation (Option 001 only)³ Linearity: <0.2 dB Calibrated Range: up to 5 dB/GHz For Full Sweep Width 83572A 7 dB 83572B 11 dB Option 001/006 1.5 dB less

Table 1-2. Supplemental Performance Characteristics for Model 83572A/B
Installed in Model 8350A/B (2 of 2)

MODULATION CHARACTERISTICS			
<p>External AM</p> <p>Frequency Response: DC to 10 kHz Input Impedance: 30k Ohms nominal Range of Amplitude Control: Unleveled 30 dB Externally Leveled (Option 001): 83572A 7 dB 83572B 11 dB (Option 001/006) 1.5 dB less Sensitivity: Externally leveled (Option 001): 1 dB/V</p>			
<p>External Pulse and Square Wave Modulation (Option 006 only, unleveled output)</p> <p>TTL Compatible: Logic HIGH=RF ON, Logic LOW=RF OFF Rise Time: 300 ns Fall Time: 50 ns Minimum Pulse Width: 500 ns Modulation Rate: 500 Hz to 1 MHz On/Off Ratio: 26 dB</p>			
<p>External FM</p> <p>Frequency Response (DC to 200 kHz): ± 3 dB Sensitivity (switch selectable): FM Mode: -20 MHz/V Phase-Lock Mode: -6 MHz/V Direct Coupled: -20 MHz/V Input Impedance: 2k Ohms nominal</p>			
GENERAL CHARACTERISTICS			
<p>Weight: Net 5.1 kg (11.3 lb.), Shipping 8.4 kg (18.6 lb.)</p>			
83572-60071 DC1 DIRECTIONAL COUPLER 10 dB			
Frequency (GHz)	26.5 to 40	Directivity	≥ 36 dB
Mean Coupling Accuracy ⁴	$\leq \pm 8$ dB	SWR (Main Guide)	≤ 1.05
Coupling Variation	$\leq \pm 6$ dB	SWR (Auxiliary Arm)	≤ 1.2
<ol style="list-style-type: none"> 1. Unless otherwise noted, all characteristics are at the RF OUTPUT connector and at 0° to 55°C. 2. Approach desired frequency from low end of band. 3. Power sweep and slope compensation total must not exceed 7 dB for the 83572A or 11 dB for the 83572B (1.5 dB less for Option 001/006). 4. Mean coupling is the average of the maximum and minimum coupling values. 			

Table 1-3. Service Accessories Available

Name	HP Part Number	Description
44-pin printed circuit board extender	08350-60031*	Extends printed circuit boards
RF Plug-in Extender Cables	08350-60034* 08350-60035*	Extends RF Plug-in Interface connector (P2) Extends RF Plug-in Power Supply Interface connector (P1)
Adjustment Tool	8830-0024	Fits miniature adjustment slot on potentiometers
Wrenches	08555-20097 8710-0946	5/16 in slotted box/open end 15/64 in open end
Service Cables	8120-1578 83525-60019	18 in Coax with SMA (m) connector on each end 10 in Coax with SMB snap on (f) and SMA (m)
Hex Balldriver	8710-0523*	Removes front panel hold down plate hex screws in 8350A/B
IC Test Clip	1400-0734* 1400-0979*	16-pin IC test clip 20-pin IC test clip
*These items are included in a Service Accessories Kit HP Part No. 08350-60020 (2 board extenders are included in this kit).		

Table 1-4. Recommended Test Equipment (1 of 2)

Instrument	Critical Specifications	Recommended Model	Use*
Sweep Oscillator	No substitute	HP 8350A/B	P,A,T
Digital Voltmeter (DVM)	Range: -50V to +50V Accuracy: $\pm 0.01\%$ Input Impedance: $\geq 10\text{M Ohms}$	HP 3456A	A,T
Oscilloscope	Dual Channel Bandwidth: DC to 100 MHz Vertical Sensitivity: $\leq 5\text{mV/DIV}$ Horizontal Sweep Rate: $\leq 0.1 \text{ uS/DIV}$ External Sweep Capability	HP 1740A	P,A,T
Oscilloscope Probes	1:1 General Purpose Probe 10:1 Probe	HP 10008B HP 10040A	A,T A,T
Spectrum Analyzer	Frequency Range: 18.6 to 40.0 GHz Residual FM: <100 Hz peak Compatible with HP 11970A External Harmonic Mixer	HP 8566A	P,A,T
Microwave Power Amplifier	No Substitute	HP 11975A	P,A,T
External Harmonic Mixer	No Substitute	HP 11970A	P,A,T
Crystal Detector	Frequency Response: 26.5 to 40.0 GHz Maximum Input Power: 100 mW Waveguide connector size WR28	HP R422A	P,A
Frequency Meter	Frequency Accuracy: $\leq 0.12\%$ Calibration Increments: $\leq 10 \text{ MHz}$ Frequency Range: 26.5 to 40.0 GHz Waveguide connector size WR28	HP R532A	P,A
Function Generator	Frequency Range: 0.1 Hz to 10 MHz Sinewave and squarewave output Output Level: 10 Vp-p into 50 Ohms Output Level Flatness: < $\pm 3\%$ from 10 Hz to 100 kHz < $\pm 10\%$ from 100 kHz to 10 MHz	HP 3312A	P,A,T
Power Meter	Power Range: -20 to +10 dBm (No substitute when used for external power meter leveling.)	HP 432A	P,A
Power Sensor	Frequency Range: 26.5 to 40.0 GHz Maximum SWR: ≤ 2.0 Waveguide connector size WR28	HP R486A	P,A

Table 1-4. Recommended Test Equipment (2 of 2)

Instrument	Critical Specifications	Recommended Model	Use*
Directional Coupler	Frequency Range 26.5 to 40.0 GHz Nominal Coupling: 10 dB Maximum Coupling Variation: ± 0.6 dB Minimum Directivity: 40 dB Waveguide connector size WR28	HP R752C	P
RMS Voltmeter	dB Range: -20 to -70 dBm (0 dBm = 1 mW into 600 Ohms) Frequency Range: 10 Hz to 10 MHz Accuracy: $\pm 5\%$ of full scale	HP 3400A	P
Vane Attenuator	Frequency Range: 26.5 to 40.0 GHz Incremental Attenuation 0 to 50 dB Calibration Accuracy: $\leq \pm 0.1$ dB Waveguide connector size WR28	HP R382A	P,A,T
Adjustable Short	Frequency Range: 26.5 to 40.0 GHz Waveguide connector size WR28	HP R920B	P
60 cm (24 in) cable	Limits bandwidth to approx 100 Hz	HP 11170B	P
Adjustable AC Line Transformer	100-120V 220-240V	General Radio W5MTB W10HM73	P
Line Monitor	120V 240V	RCA WV 120B RCA WV 503A	P
PC Board Extender	44-pin, extends printed circuit boards	HP Part No. 08350-60031	A,T
*P = Performance Test; A = Adjustments; T = Troubleshooting			

SECTION II INSTALLATION

2-1. INTRODUCTION

2-2. This section provides installation instructions for the HP 83572A/B RF Plug-In. This section also includes information about initial inspection, damage claims, preparation for use, packaging, storage, and shipment.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV, Performance Tests, of this Operating and Service Manual. If the instrument combination does not pass the electrical Performance Tests, refer to Section V, Adjustments, of this manual. If, after the adjustments have been made, the instrument combination still fails to meet specifications, and a circuit malfunction is suspected, refer to troubleshooting procedures in Section VIII, Service, in this manual. If the instrument does not pass the above electrical tests, if the shipment contents are incomplete, or if there is mechanical damage or defect, notify the nearest Hewlett-Packard Office. If the shipping container is damaged, or if the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard Office. Keep the shipping materials for the carrier's inspection. The HP Office will arrange for repair or replacement without waiting for claim settlement.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. When the HP 83572A/B RF Plug-In is properly installed, it obtains all power through the rear panel interface connector from the Model 8350A/B Sweep Oscillator.

2-8. RF Plug-In Configuration Switch

2-9. The HP 83572A/B RF Plug-In has a configuration switch (A3S1) located on the A3 Digital Interface Board. This switch must be preset prior to RF Plug-In operation in the Model 8350. The configuration switch is an 8-section multiple switch. Each separate switch section corresponds to a separate RF Plug-In feature such as instrument number (83572A or 83572B), Option installed, FM sensitivity selection, FM input coupling selection (direct coupled or cross-over), or RF power level at power on (maximum or off). Refer to Section III, Operation, in this manual for a complete description of the configuration switch and instructions on how to set the switch sections.

2-10. Interconnections

2-11. There are two rear panel interconnections from the HP 83572A/B RF Plug-In to the HP 8350A/B Sweep Oscillator. These are the RF Plug-In Interface connector (P2) and the Power Supply Interface connector (P1). A complete listing of pins and associated signals for these connectors is provided in Figures 2-1 and 2-2.

2-12. Mating Connectors

2-13. The externally mounted connectors on the HP 83572A/B are listed in Table 2-1. Opposite each connector is an industry identification, the HP part number of a mating connector, and the part number of an alternate source for the mating connector. For HP part numbers of the externally mounted connectors themselves, refer to Section VI, Replaceable Parts, of this manual.

2-15. Temperature. The instrument may be operated in temperatures from 0°C to +55°C.

2-16. Humidity. The instrument may be operated in environments with humidity from 5% to 80% relative at +25°C to +40°C. The instrument should be protected from temperature extremes which may cause condensation within the instrument.

Table 2-1. HP 83572A/B Mating Connectors

HP 83572A/B Connector		Mating Connector	
Connector Name	Industry Identification	HP Part No.	Alternate Source
W1 RF OUTPUT WAVEGUIDE	JAN UG - 599 flange	-	-
J1 EXT/MTR ALC INPUT	BNC (f)	1250-0256 Straight cable	Specialty Connector 25-P118-1
J2 PULSE IN (Opt. 006)	BNC (f)	1250-0256 Straight Cable	Specialty Connector 25-P118-1

2-17. Altitude. The instrument may be operated at altitudes up to 4572 meters (15,000 feet).

2-18. Cooling. When the HP 83572A/B RF plug-in is properly installed in the HP 8350A/B sweep oscillator, it obtains all of its cooling airflow by forced ventilation from the fan in the HP 8350A/B. A diagram showing the various cooling airflow paths within the sweep oscillator is given in Section II, Installation, of the HP 8350A/B sweep oscillator Operating and Service Manual. Ensure that all airflow passages in the HP 8350 and the HP 83572A/B are clear before installing the RF plug-in in the sweep oscillator.

2-19. Installation Instructions

2-20. To operate as a completely functional sweep oscillator, the HP 83572A/B RF plug-in must be installed in an HP 8350A/B sweep oscillator. To install the HP 83572A/B RF plug-in in the HP 8350A/B sweep oscillator:

- a. Set the HP 8350A/B mainframe LINE switch to OFF.
- b. Remove all connectors and accessories except the waveguide flange cover from the front and rear panel connectors of the HP 83572A/B to prevent them from being damaged.
- c. Position the RF plug-in unit latching handle in the fully raised position. The latching handle should spring easily into the raised position and be held by spring tension.
- d. Ensure that the HP 8350A/B RF plug-in channel is clear. Align the RF plug-in in the

channel and slide it carefully into place toward the rear of the channel. It should slide easily without binding.

- e. The drawer latch handle slot will engage with the locking pin just before the RF plug-in is fully seated in position.
- f. Press the latch handle downward, while still pushing in on the RF plug-in, until the drawer latch is fully closed and the front panel of the RF plug-in is aligned with the sweep oscillator front panel.

2-21. STORAGE AND SHIPMENT

2-22. Environment

2-23. The instrument may be stored or shipped in environments within the following limits:

- Temperature -40°C to +75°C
- Humidity..... 5% to 95% relative at 0° to +40°C
- Altitude Up to 15240 meters (50,000 feet)

2-24. The instrument should also be protected from temperature extremes which may cause condensation in the instrument.

2-25. Packaging

2-26. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. A diagram and listing of packaging

materials used for the HP 83572A/B is shown in Figure 2-3. If the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number (located on the rear panel serial plate). Mark the container FRAGILE to ensure careful handling. In any correspondence refer to the instrument by model number and full serial number.

2-27. Other Packaging. The following general instructions should be used for repackaging with commercially available packaging materials:

- a. Wrap the instrument in heavy paper or plastic. If shipping to a Hewlett-Packard Office or Service Center, attach a tag indicating the type of service required, return address, model number, and full serial number.

- b. Use a strong shipping container.
- c. Use enough shock-absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container. Protect the control panel with cardboard. If the instrument is an Option 001, disconnect the front panel attachments and pack them in additional shock-absorbing material.
- d. Seal the shipping container securely.
- e. Mark the shipping container FRAGILE to ensure careful handling.
- f. In any correspondence, refer to the instrument by model number and full serial number.

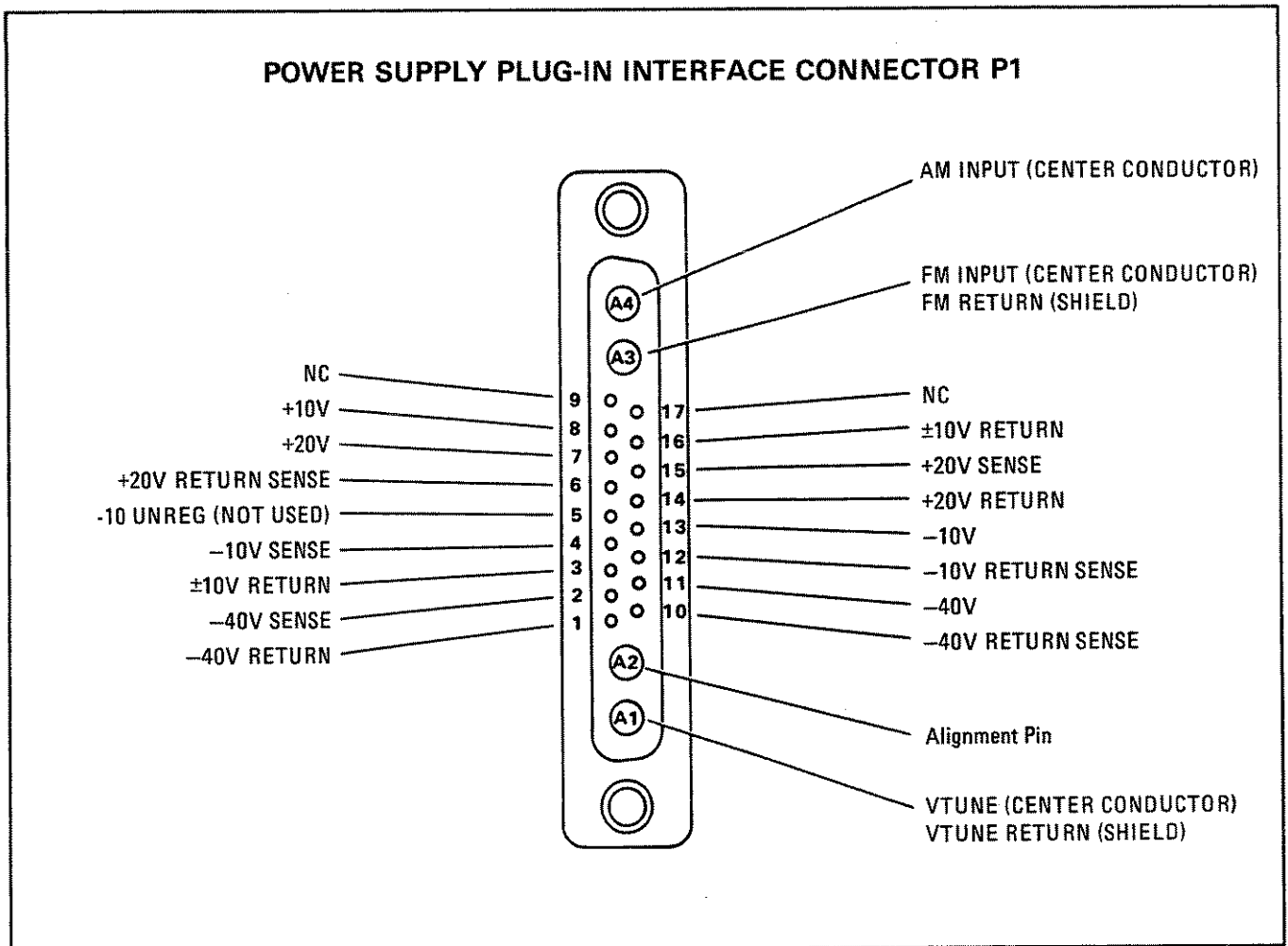


Figure 2-1. Interface Signals on Connector P1

PLUG-IN INTERFACE CONNECTOR P2

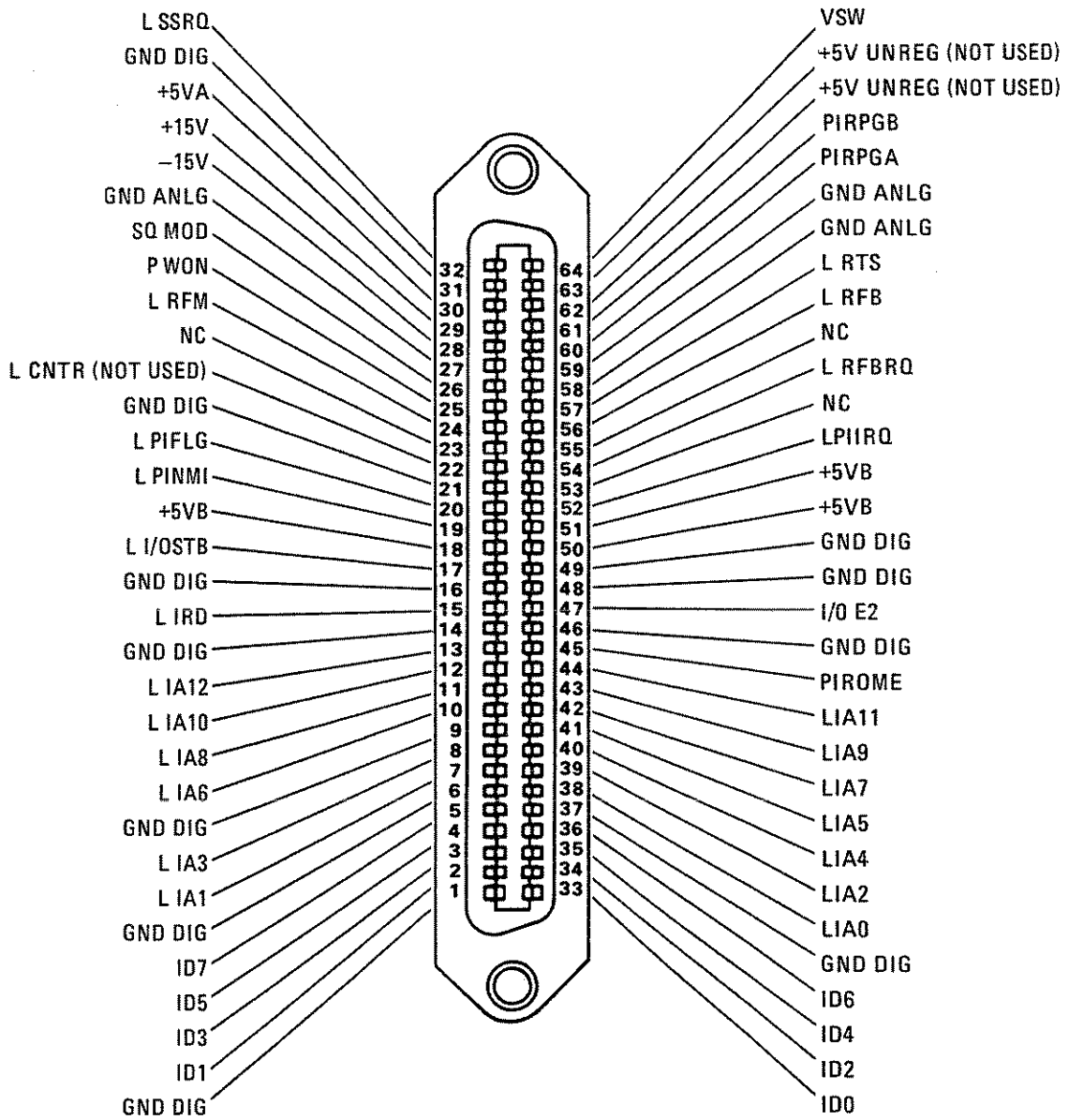
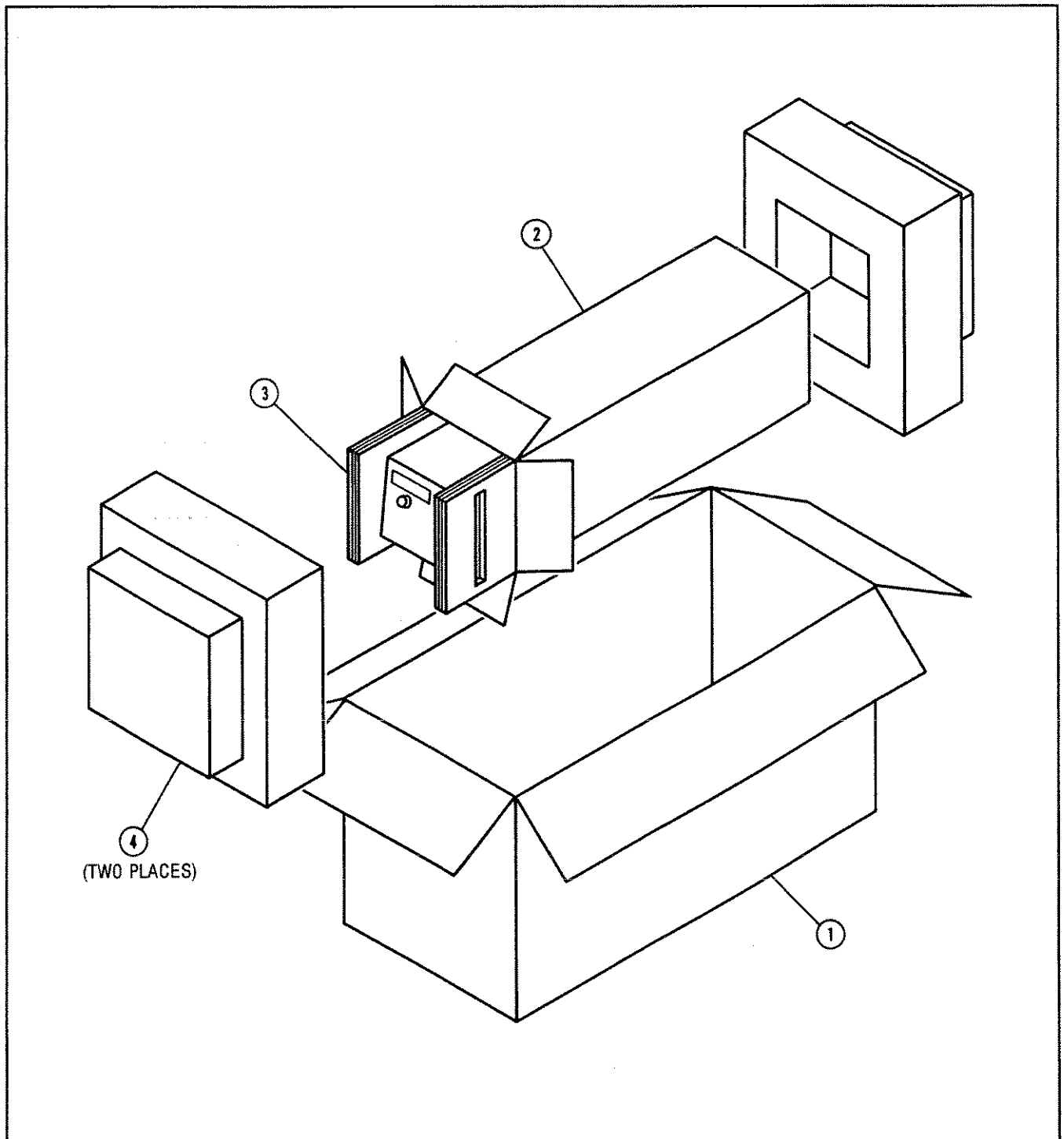


Figure 2-2. Interface Signals on Connector P2



Item	Quantity	HP Part Number	C D	Description
1	1	9211-3515	6	Outer Carton
2	1	9211-3514	5	Inner Carton
3	2	9220-3409	6	Side Pads - Corrugated Cardboard
4	2	9220-3406	3	Foam Pads
	1	9222-0352	6	Poly Bag - to cover instrument

Figure 2-3. Packaging for Shipment Using Factory Packaging Materials

SECTION III OPERATION

3-1. INTRODUCTION

3-2. This section is divided into several parts. Front and rear panel features are shown with descriptions. Operator's Checks are referenced, with information on RF plug-in error codes. Operating Instructions provide crystal detector and power meter leveling procedures, and configuration switch settings. Operator's Maintenance provides information on fuses and service tags.

3-3. PANEL FEATURES

3-4. Front and rear panel features are described in Figures 3-1 and 3-2 respectively.

3-5. OPERATOR'S CHECKS

3-6. The Operator's Checks (Local and Remote) in the Operating and Service Manual for the HP 8350A/B sweep oscillator provide a quick evaluation of the main functions of both the 8350A/B and the RF plug-in. Change the test setup for the Local Operator's Check by deleting the attenuator and using an R-band detector. The Local Operator's Check verifies both the sweep oscillator and the RF plug-in; therefore, if the correct indications are not obtained, the trouble may be in either of the units. Error codes E050 to E059 are indications of RF plug-in errors: further information on RF plug-in error codes is provided in Section VIII of this manual. If the RF plug-in is suspected, follow the troubleshooting information in Section VIII to isolate the problem.

3-7. OPERATING INSTRUCTIONS

3-8. Unleveled Power

3-9. The unleveled power mode can be accessed by pressing either [INSTR PRESET] or [UNLVLD PWR]. The power level can be changed with the step keys, the keyboard, or the POWER knob. The change is nonlinear and generally will not correspond with the power displayed in the POWER display. The CAL adjust is enabled in this mode. It can be used to adjust the POWER display equal to a power meter reading in either CW or swept frequency modes. The output power will remain unleveled in this mode.

3-10. External Leveling

3-11. External Crystal Detector Leveling

3-12. The RF output power may be leveled externally using a directional coupler and a negative output crystal detector. The directional coupler samples a portion of the RF output signal, and the crystal detector produces a DC voltage proportional to the RF output power level. The detector output voltage is compared with an internal reference voltage, and the difference voltage is amplified by the ALC amplifier before being applied as modulator drive to a ferrite modulator which changes the output power level. Figure 3-3 illustrates and describes a typical crystal detector leveling setup.

3-13. Calibrated External Crystal Detector Leveling (Option 001)

3-14. The Option 001 calibrated external leveling includes an external R-band 10-dB coupler, an R-band crystal detector, and a BNC cable, calibrated together at the factory to the individual HP 83572A/B RF plug-in. This leveling system uses the Option 001 coupler to sample a portion of the RF output signal with the crystal detector to produce a DC voltage proportional to the RF output power level. The detector output voltage is compared with an internal reference voltage. The difference voltage is then amplified by the ALC amplifier before being applied as modulator drive to a ferrite modulator, which changes the output to keep a constant RF output power level. With Option 001, the power level at the output of the Option 001 coupler is the same as the front panel POWER display at all available power levels and all frequencies. This mode can be accessed only by pressing [SHIFT] [DET]. In this mode the CAL light above the DET pushbutton is lit, and the CAL adjust is disabled.

3-15. External Power Meter Leveling

3-16. RF output power may also be leveled with a power meter and a directional coupler as shown in Figure 3-4. A sweep time of 100 seconds must

be used with this leveling method. A sample of the RF output signal is routed to a power meter which produces a DC output voltage proportional to the RF input signal level. This DC voltage is applied to the HP 83572A/B ALC circuits and compared with an internal reference voltage. A difference voltage is produced and amplified by the ALC amplifier before being applied as modulator drive to a ferrite modulator.

3-17. External FM

3-18. The HP 83572A/B RF output signal can be frequency modulated using an external modulating signal applied to the HP 8350A/B rear panel FM INPUT connector. The external FM function provides a means of obtaining an output frequency that varies under the control of an external modulating signal. A positive-going voltage at the FM INPUT causes the output frequency to decrease, while a negative-going voltage causes the output frequency to increase. The sensitivity and coupling of the modulating signal can be set with configuration switch A3S1. Figure 3-5 lists the available configuration switch settings. The configuration switch settings override the HP 8350A/B sweep oscillator's nonvolatile memory settings at instrument preset.

3-19. External Amplitude Modulation

3-20. Pulse Modulation (Option 006)

3-21. The Option 006 provides the squarewave modulation capabilities necessary for the HP 8350/83572 to function with the HP 8755 or 8756 scalar network analyzer. For compatibility with the HP 8755 or 8756, the internal squarewave modulation frequency is preset to 27.8 kHz with a jumper on the sweep generator board of the HP 8350A/B. The on/off ratio of internal squarewave modulation is greater than 20 dB. The \square MOD key on the front panel of the 8350A/B activates the internal squarewave modulation feature.

3-22. The PULSE IN connector on the rear panel of the HP 83572A/B Option 006 allows the RF signal to be pulsed or squarewave modulated by an external signal. The PULSE IN input is normally at a TTL HIGH level (approximately +3 volts DC). When a TTL LOW signal (approximately 0 volts DC) is applied, the RF output is turned off. The on/off power ratio is typically greater than 26 dB. With unlevelled power, a pulse repetition rate of up to 1 MHz is

achievable. See the specifications and supplemental performance characteristics in Section I for more details on the modulation characteristics when using this input.

3-23. Amplitude Modulation

3-24. The AM INPUT on the rear panel of the HP 8350A/B allows the RF signal to be externally amplitude modulated. In the unlevelled power mode, amplitude changes as wide as 30 dB are available, not proportional to the modulating input voltage. AM frequency response is typically limited to 10 kHz.

3-25. In all the externally leveled modes, amplitude changes can be achieved as wide as 7 dB, which are logarithmically proportional to the modulating input voltage (1 dB/volt nominal). Again, frequency response is typically limited to 10 kHz. For maximum depth of modulation (i.e. maximum modulation index), the RF power level should be set to the middle of the control range (-1.5 dBm for an HP 83572A with calibrated power control from +2 dBm to -5 dBm; +0.5 dBm for an HP 83572B with calibrated power control from +6 dBm to -5 dBm). The center of the power control range can be selected with the front panel power controls or by applying a DC bias voltage on the external modulating signal. A positive (+) DC voltage into the AM INPUT causes an increase in RF output power, and a negative (-) DC voltage causes a decrease in RF output power.

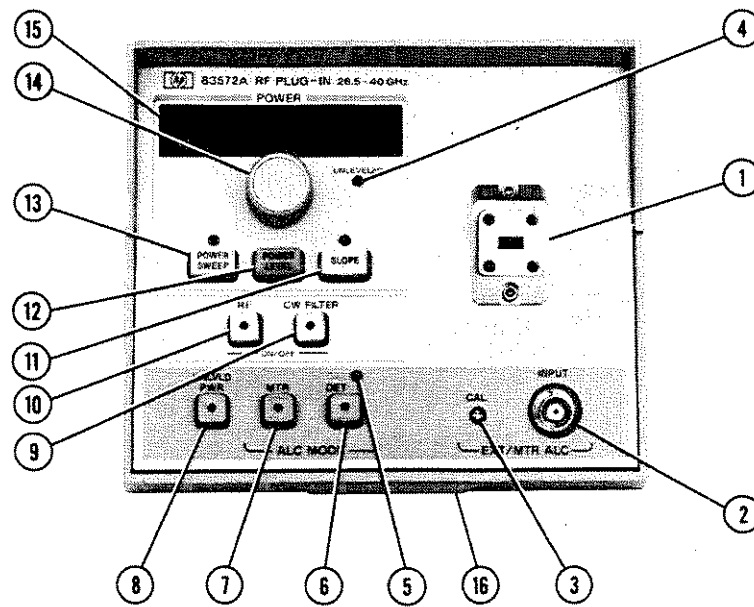
3-26. OPERATOR'S MAINTENANCE

3-27. Fuses

3-28. Power circuits for the HP 83572A/B are fused in the HP 8350A/B sweep oscillator mainframe. Refer to the HP 8350A/B Operating and Service Manual for fuse replacement information.

3-29. Blue Service Tags

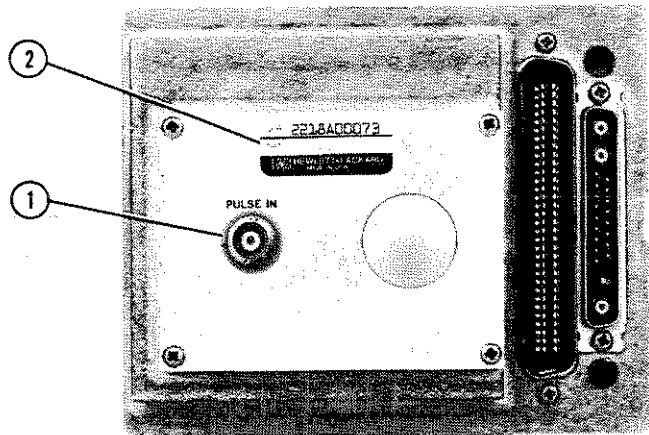
3-30. If the HP 83572A/B requires service, it may be sent to the nearest Hewlett-Packard service organization as described in Section II. Before returning the instrument, fill out and attach one of the blue service tags included at the end of this section. Record any error codes noted in the FAILURE SYMPTOMS/SPECIAL CONTROL SETTINGS section of the tag.



FRONT PANEL FEATURES

1. RF output waveguide connector (EIA size WR 28 waveguide) mates with JAN UG-599 flange.
2. BNC connector for power meter or external crystal detector leveling inputs (including Option 001).
3. ALC CAL adjustment, for setting power level in external power meter or crystal detector leveling.
4. UNLEVELED lamp lights when output power is unlevelled.
5. CAL lamp lights when [SHIFT] [DET] is pressed or enabled. In this mode Option 001 calibration is enabled and CAL adjust is disabled.
6. External crystal detector leveling selection.
7. Power meter leveling control selection (HP 432 power meter only).
8. Unlevelled power control selection.
9. CW filter enables an oscillator tuning voltage filter in CW mode.
10. RF on/off key. Turns RF power on or off. Used for zeroing a power meter or referencing an X-Y recorder.
11. SLOPE provides a linear increase in power with frequency (dB/GHz) to compensate for system/cable losses at higher frequencies (Option 001 only).
12. POWER LEVEL provides control of output power.
13. POWER SWEEP sweeps power at a CW frequency. POWER LEVEL sets the starting point; POWER SWEEP sets the power sweep width in dB (Option 001 only).
14. Power control knob for controlling power sweep, power level, or slope.
15. Display provides readout of selected power mode in dBm, dB/GHz, or dB/SWP to 0.1 dB.
16. Latch handle is used to remove, install, and latch the RF plug-in in the sweep oscillator mainframe.

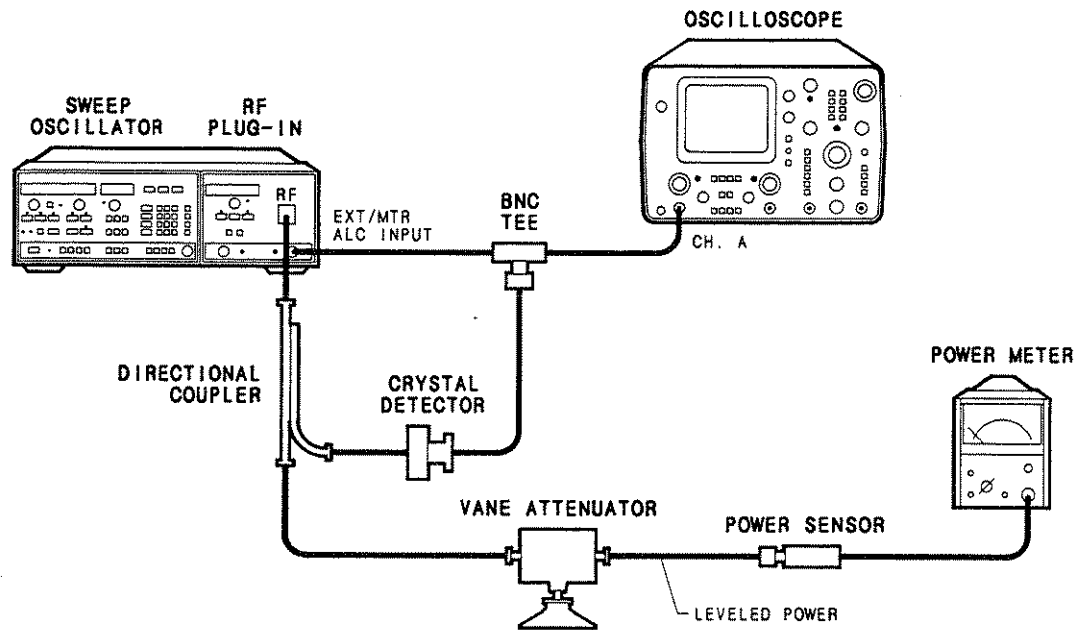
Figure 3-1. Front Panel Features



REAR PANEL FEATURES

1. **PULSE IN** connector is used to input external pulse or squarewave modulation signals (Option 006 only).
2. Serial number plate has a ten digit serial number (used in any correspondence concerning the RF plug-in), as well as Option number if applicable.

Figure 3-2. Rear Panel Features



EXTERNAL CRYSTAL DETECTOR LEVELING

EQUIPMENT:

Sweep Oscillator	HP 8350A/B
RF Plug-In	HP 83572A/B
Oscilloscope	HP 1740A
Power Meter	HP 432A
Power Sensor	HP R486A
Crystal Detector	HP R422A
Directional Coupler	HP R752C
Vane Attenuator	HP R382A

PROCEDURE:

NOTE

Crystal output signal must be between -10 mVdc and -200 mVdc.

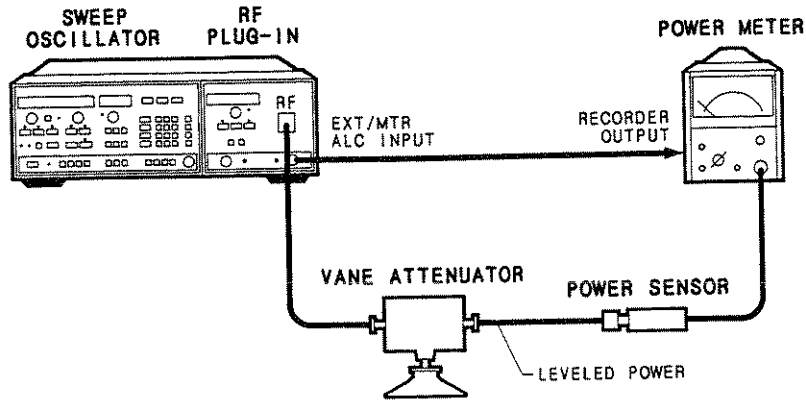
1. Connect the equipment as shown in the test setup.
2. Switch on the 8350A/B LINE power and press [INSTR PRESET]. The START and STOP indicators should be on. On the 83572A/B, press ALC MODE [DET].
3. Set the vane attenuator to 10 dB.
4. Set the power meter range to -5 dBm (83572A), or 0 dBm (83572B).
5. If the RF plug-in is an HP 83572A, adjust the EXT/MTR ALC CAL for a power meter reading of -3 dB (this corresponds to $+2$ dBm at the output of the waveguide coupler). If the RF plug-in is an HP 83572B, adjust the EXT/MTR ALC CAL for a power meter reading of -4 dB (this corresponds to $+6$ dBm at the output of the waveguide coupler).

NOTE

The power level at the output of the directional coupler is typically 1.0 dB less than at the RF output of the plug-in.

6. To use leveled RF power for testing external equipment, make a connection at the point in the test setup marked "Leveled Power".

Figure 3-3. External Crystal Detector Leveling



EXTERNAL POWER METER LEVELING

EQUIPMENT:

Sweep Oscillator.....	HP 8350A/B
RF Plug-In.....	HP 83572A/B
Power Meter.....	HP 432A
Thermistor Mount.....	HP R486A
Vane Attenuator.....	HP R382A

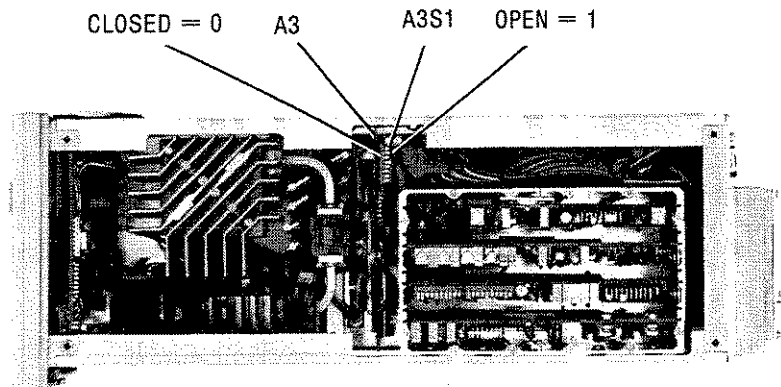
NOTE

For power meter leveling, a sweep rate of 100 sec/sweep should be used to ensure proper leveling, due to the slow response of the thermistor mount. The HP 435 and 436 power meters will not power meter level this plug-in. Only an HP 432 can be used.

PROCEDURE:

1. Connect the equipment as shown in the test setup.
2. Turn on the power to the sweep oscillator. Press [INSTR PRESET] [SWEEP TIME] [1] [0] [0] [SEC].
3. On the 83572A/B, set the output power to maximum specified, and press ALC MODE [MTR].
4. Set the vane attenuator to 10 dB.
5. Set the power meter range to -5 dBm (83572A), or 0 dBm (83572B).
6. If the RF plug-in is an HP 83572A, adjust the EXT/MTR ALC CAL for a power meter reading of -3 dB (this corresponds to +2 dBm at the RF output of the plug-in). If the RF plug-in is an HP 83572B, adjust the EXT/MTR ALC CAL for a power meter reading of -4 dB (this corresponds to +6 dBm at the RF output of the plug-in). Press 8350A/B SWEEP TRIGGER [SINGLE] key twice to set the single sweep mode and start a sweep.
7. To use leveled RF power for testing external equipment, make a connection at the point in the test setup marked "Leveled Power".

Figure 3-4. External Power Meter Leveling



Code Description	Switch Number							
	1	2	3	4	5	6	7	8
Instrument/Option								
Standard 83572A	0	0	0	X	X	X	X	X
Standard 83572B	1	0	0	X	X	X	X	X
83572A Option 001	0	1	0	X	X	X	X	X
83572B Option 001	1	1	0	X	X	X	X	X
83572A Option 006	0	0	1	X	X	X	X	X
83572B Option 006	1	0	1	X	X	X	X	X
83572A Option 001/006	0	1	1	X	X	X	X	X
83572B Option 001/006	1	1	1	X	X	X	X	X
No RF Power at INSTR PRESET	Z	Z	Z	1	X	X	X	X
Maximum RF Power at INSTR PRESET	Z	Z	Z	0	X	X	X	X
-6 MHz/V FM Sensitivity	Z	Z	Z	X	1	X	X	X
-20 MHz/V FM Sensitivity	Z	Z	Z	X	0	X	X	X
Direct-Coupled FM (-20 MHz/V)	Z	Z	Z	X	X	1	X	X
Cross-Over Coupled FM	Z	Z	Z	X	X	0	X	X

NOTES

- Switch Positions
 1 = switch open = High
 0 = switch closed = Low (ground)
 X= don't care
 Z= determined by instrument and options installed
- Switch is set at the factory as follows:

Switch No	1	2	3	4	5	6	7	8
Position	Z	Z	Z	0	0	0	X	X

Figure 3-5. Configuration Switch A3S1

